

Overview

The subject Site is a former chemical manufacturing facility located within an industrial pole in Bahia, Brazil (IMAGE 1). A STARx Hottpad™ pilot test was conducted to treat chloronitrobenzene-impacted soils from two areas of the site undergoing decommissioning/remediation.



IMAGE 1: Former chemical manufacturing facility located within an industrial pole in Bahia, Brazil

Pilot Test Objectives

The pilot system deployed to the site consisted of two 10m³ Hottpads (IMAGE 2). The dual Hottpad configuration was selected to rapidly test soils from both areas using a variety of amendments: crushed concrete (present on site due to decommissioning activities) to act as a bulking agent for the clayey site soils; and surrogate fuels to support the combustion of the volatile / semi-volatile chloronitrobenzene compounds present. Surrogate fuels investigated during the pilot included granular activated carbon (GAC), which is commonly used for the smoldering of soils impacted with volatile/semi-volatile contaminants, and two 'sustainable fuels' – eucalyptus bark and coconut husks, which are readily available as waste biomass in the region.



IMAGE 2: Dual Hottpad™ pilot system showing the two 10m³ treatment vessels and the vapor extraction and treatment system (Granular Activated Carbon [GAC]).

System Operation

A total of eight (8) tests were conducted to assess the degree of soil treatment, constituents and their concentrations in process emissions, smoldering velocity (i.e., processing time), and average/peak temperature for the two soil types, three surrogate fuels, and varying amounts of crushed concrete added for bulking. Each mixture was placed in the Hottpad™ system for treatment then covered with a clean soil cap to act as a heat sink and a vapor collection system prior to initiation of smoldering. For each test, self-sustaining smoldering conditions were achieved, with complete treatment of all soil mixtures placed within the vessels (IMAGE 3). The results of testing will allow the project team to design a full-scale system for the treatment of impacted soils, considering project duration, total cost, and Key Performance Indicators (KPIs) for the site such as sustainability.



IMAGE 3: Site soils following STARx treatment using different surrogate fuels to support the combustion process: a) GAC; b) eucalyptus bark; and c) coconut husks.

Conclusions

The STARx technology is a rapid, safe, and low-cost treatment option for soils impacted with volatile/semi-volatile compounds such as chloronitrobenzene compounds.

The pilot test conducted demonstrated the flexibility of the smoldering combustion process, as multiple surrogate fuel types and bulking concentrations resulted in successful treatment and will allow the team to balance various project needs such as cost, duration, and sustainability goals during full-scale planning/design.